I CLAIM:

1. A thermal flux regulator for a heated reactor, said regulator comprising:
a reactor chamber for housing said reactor a first heat regulating chamber surrounding said reactor chamber, said first heat regulating chamber containing a first heat transfer regulating mixture having a metallic component A having a melting point T_A and a particulate component B which is non-wettable by the metallic component A, non-reactive therewith and has a melting temperature T_B which is a higher than both the temperature T_A and a first desired operating temperature T_{D1} which is also higher than T_A.

2. A thermal flux regulator as claimed in claim 1 further having:
a second heat regulating chamber disposed outwardly of said first heat regulating chamber, said second heat regulating chamber containing at least one of a liquid, a gas, a partial vacuum, a solid and a second heat transfer regulating mixture.

3. A thermal flux regulator as claimed in claim 2 wherein:
said second heat regulating chamber is filled with a second heat transfer regulating mixture which contains a metallic component X having a melting point T_X which is lower that T_A and a particulate component Y non-wettable by said metallic component X and having a melting point T_Y which is higher than both T_X and a second desired operating temperature T_{D2}.

4. A thermal flux regulator as claimed in claim 1 wherein said first heat regulating chamber is surrounded by a heat sink comprising at least one of fins and a cooling coil.

5. A thermal flux regulator as claimed in claim 2 wherein said second heat regulating chamber is surrounded by a heat sink comprising at least one of fins and a cooling coil.

6. A thermal flux regulator as claimed in claim 3 wherein said second heat regulating chamber is surrounded by a heat sink comprising at least one of fins and a cooling coil.

7. A thermal flux regulator as claimed in claim 1, 2, 3, 4, 5 or 6 wherein:
said first heat regulating chamber includes a volume adjuster acting between said first chamber and said first heat transfer regulating mixture to apply a compressive force to said heat transfer regulating mixture.

8. A thermal flux regulator as claimed in claim 7 wherein:
said first heat regulating chamber is defined by inner and outer tubular members capped, at at least one end thereof by a sealing member which sealingly and slidably engages said inner and outer tubular members as part of said volume adjuster.

9. A thermal flux regulator as claimed in claim 7 wherein:
said first heat regulating chamber is defined between inner and outer tubular members capped at opposite ends by respective sealing members which slidably and sealingly engage said inner and outer tubular members;
a pair of platens clampingly engaging said sealing members to urge said sealing members into said first chamber; and,
biasing members operably connected to said platens for applying a clamping force to said platens, said clamping force being transmitted to said sealing members by said platens and by said sealing rings to said heat transfer regulating mixture as said compressive force.

10. A thermal flux regulator as claimed in claim 8 wherein:
opposite ends of said heat regulating chamber are capped with respective end caps of a heat insulating material; and,
at least one of said end caps is provided with an access opening for providing access to said reactor.

11. A thermal flux regulator as claimed in claim 9 wherein:
opposite ends of said heat regulating chamber are capped with a respective end cap of a heat insulating material; and
at least one of said end caps is provided with an access opening for providing access to said reactor.

12. A thermal flux regulator as claimed in claim 2 wherein:
said second heat regulating chamber has inner walls coated with a reflective material.

13. A method of controlling the flow of heat flux between a heat source and a heat sink

comprising the steps of :

(i) providing a first thermal regulator between said heat source and a heat sink which varies between a higher and a lower thermal conductivity at a first predetermined temperature: and,

(ii) providing a second thermal regulator between said first thermal regulator and said heat sink which varies between a higher thermal conductivity and a lower thermal conductivity at a second predetermined temperature lower than said first predetermined temperature.

14. A method as claimed in claim 13 wherein:
said first thermal regulator is a mixture of a first ceramic powder having a melting point above said first predetermined temperature and above a temperature of said heat source and a first metal powder which is non-wetting of and non-reactive with said first ceramic powder and which has a melting point at said first predetermined temperature;
said ceramic powder being present in an amount sufficient to fill said first thermal regulator to avoid segregation of said first ceramic and metal powders upon melting of said first metal powder.

15. A method as claimed in claim 14 including the further step of:
applying pressure to said first ceramic powder to vary its thermal conductivity.

16. A method as claimed in claim 15 wherein:
said mixture of said first ceramic and metal powders are in a non-reactive gaseous environment having a predetermined gas pressure.

17. A method as claimed in claim 14, 15 or 16 wherein:
said second thermal regulator is a mixture of a second ceramic powder having a melting point above said second predetermined operating temperature; and,
a second metal powder which is non-wetting of and non reactive with said second ceramic powder;
said second ceramic powder being present in an amount sufficient to fill said second thermal regulator, to avoid segregation of said second ceramic and said second metal powders upon melting of said second metal powder.

18. A method as claimed in claim 17 including the further step of:
applying pressure to said second ceramic powder to vary its thermal conductivity.

19. A method as claimed in claim 18 wherein:
said mixture of said second ceramic and metal powders are in a gaseous environment which is non-reactive therewith and has a predetermined gas pressure.